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(73) Proprietor: **FUJI KIKO COMPANY LIMITED**
1-13, Nihonbashihon-cho 3-chome Chuo-Ku
Tokyo(JP)

(72) Inventor: **Asano, Yasushi c/o Fuji Kiko Company Limited**
Washizu-plant 2028, Washizu
Kosai-shi Shizuoka-ken(JP)
Inventor: **Kataumi, Yoshimasa c/o Fuji Kiko Company Limited**
Washizu-plant 2028, Washizu
Kosai-shi Shizuoka-ken(JP)

(74) Representative: **Blanco White, Henry Nicholas et al**
ABEL & IMRAY Northumberland House
303-306 High Holborn
London WC1V 7LH (GB)

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Description

The present invention relates to a position adjustable pedal assembly for a vehicle. More specifically, the present invention relates to an automotive position adjustable pedal assembly to be used such as for brake, accelerator and clutch pedals, wherein a position of the pedal is adjustable in the forward and rearward directions of the vehicle.

There has been proposed a pedal assembly which enables a driver to adjust a position of the pedal in the forward and rearward directions of the vehicle according to his or her height. This is required since if the driver's seat is adjusted forwardly or rearwardly to match his or her height, the visual field is varied corresponding to the seat position, which is not preferable in view of safety as well as the driving comfortableness. Further, if the driver's seat is moved rearwardly, the leg space for a passenger sitting on the rear seat becomes inevitably narrow. Accordingly, there have been required such a pedal assembly which makes it possible to adjust the position of the pedal forwardly and rearwardly.

In the conventional pedal assembly, however, there arises a problem of a variation in force applied to an operating member which is connected to a vehicle operation system, such as a braking system, an engine throttle valve or a clutch system, according to a position of a pedal pad between its adjustable range. Specifically, if an amount or a distance of pivotal displacement of the pedal pad, i.e. of displacement of the pedal pad in the circumferential direction caused by the depression of the pedal pad by the driver is the same, the force applied to the operating member varies according to an adjusted position of the pedal pad because of change in the length of a lever between its pivot axis at its upper end and a pedal pad at its lower end where the depression force is applied by the driver.

This variation forces the driver to operate the pedal pad differently according to the adjusted pedal pad position.

EP-A-0 256 466, on which the preamble of claim 1 is based, discloses a pedal assembly in which a pedal arm, having a pedal pad at its lower end, is connected to an adjustor member, to which is attached an operating member connected to a control system of the vehicle. In use, the combined lever formed by the pedal arm and adjustor member pivots as a unit about a pivot pin. Pins on the pedal arm can be slide along guides on the adjustor member to adjust the position of the pedal pad, and the pivot pin is received in intersecting slots in the pedal arm and the adjustor member, so that as the position of the pedal pad is adjusted the position of the pivot pin is automatically also adjusted so as to keep the mechanical advantage of the combined lever substantially constant.

It is an object of the present invention to provide a pedal assembly for a vehicle which enables a position of a pedal pad such as a brake pedal pad, an accelerator pedal pad and a clutch pedal pad to be adjusted forwardly and rearwardly of the vehicle, i.e. in a longitudinal direction of the vehicle, wherein a force applied to an operating member which transmits the applied force to a vehicle operation system such as a braking system, an engine throttle valve and a clutch system, is held substantially constant under any given pivotal displacement distance of the pedal pad caused by a driver's depression action of the pedal, irrespective of the adjusted pedal pad position.

Another object of the present invention is to provide a position adjustable pedal assembly, wherein the required depression force or leg power for depressing the pedal pad by any given distance is maintained substantially constant, irrespective of the adjusted pedal pad position.

A further object of the present invention is to provide a position adjustable pedal assembly, wherein the full depression displacement distance of the pedal pad in the circumferential direction is held substantially constant by using adjustable stopper means, irrespective of the adjusted pedal position.

A still further object of the present invention is to provide a position adjustable pedal assembly, wherein a reaction force applied to components of the pedal assembly in the direction along the length of the vehicle in response to the depression force applied to the pedal pad by the driver is considerably reduced so as to attain the strength of the pedal assembly as well as giving a smooth feel to the pedal operation.

The invention provides a position-adjustable pedal assembly for a vehicle, comprising: a stationary bracket; a lever connected to said stationary bracket for a pivotal movement relative to said stationary bracket about a first pivot axis; a pedal arm with a pedal pad at its lower end, said pedal arm connected to said lever for a pivotal movement with said lever as one integral unit in response to a depression force applied to the pedal pad; a first linear track formed on said lever and extending in the longitudinal direction of the vehicle; a first guide member provided on said pedal arm and arranged to move within said first linear track so as to adjust a position of the pedal pad in the longitudinal direction of the vehicle, said movement of the first guide member changing a distance from said first pivot axis to said pedal pad; and operating member means provided between said lever and a vehicle operation system for receiving the depression force applied to said pedal pad and for trans-

mitting said depression force to the vehicle operation system to operate same; characterised in that an adjust lever is provided on said lever, said adjust lever drivingly connected to a connecting member which is movable within a first arc-shaped track in response to a relative movement of said adjust lever to said lever, that said first guide member is movable within a second arc-shaped track formed on said adjust lever when said first guide member moves within said first linear track to adjust the position of the pedal pad in the longitudinal direction of the vehicle, that said movement of the first guide member within said second arc-shaped track allows said relative movement of the adjust lever to change a position of said connecting member within said first arc-shaped track so as to provide a predetermined relationship between said distance and a distance from said first pivot axis to said connecting member, and that said operating member means is connected to said connecting member for receiving therefrom the depression force applied to said pedal pad and for transmitting said depression force to the vehicle operation system to operate same.

The position adjustable pedal assembly may include spring means connected to the stationary bracket at its one end and to the lever at its other end, the spring means stretching or compressing in response to the variation of the distance so as to change the spring force that it applies to the lever and the pedal arm, the change of the spring force absorbing variation in a required depression force being caused by the adjustment of the position of the pedal pad.

The position adjustable pedal assembly may include stopper means provided on the lever, the stopper means having an engaging portion of a shape which has a predetermined curvature, said engaging portion being pivotable according to an adjusted pedal pad position so as to contact the stationary bracket to prevent a pivotal movement of the lever about the pivot axis exceeding a predetermined value in response to a constant pivotal displacement distance of the pedal pad from its non-depressed position irrespective of the adjusted pedal pad position, the predetermined curvature of the engaging portion not being constant.

The present invention will be understood more fully from the detailed description given hereinbelow and from the accompanying drawings of the preferred embodiment of the invention, which are given by way of example only, and are not intended to be limitative of the present invention.

In the drawings:

Fig. 1 is a side elevation showing a position adjustable pedal assembly according to a first preferred embodiment of the present invention;

Fig. 2 is a sectional view taken along the line II-II of Fig. 1;

Fig. 3 is a side elevation for showing the operation of the position adjustable pedal assembly of Fig. 1, wherein the pedal pad position is adjusted to its foremost position,

Fig. 4 is a side elevation for showing the operation of the position adjustable pedal assembly of Fig. 1, wherein the pedal pad position is adjusted to its rearmost position,

Fig. 5 is a side elevation showing a position adjustable pedal assembly according to a second preferred embodiment of the present invention,

Fig. 6 is a sectional view taken along the line VI-VI of Fig. 5,

Fig. 7 is a side elevation for showing the operation of the position adjustable pedal assembly of Fig. 5, wherein the pedal pad position is adjusted to its foremost position, and

Fig. 8 is a side elevation for showing the operation of the position adjustable pedal assembly of Fig. 5, wherein the pedal pad position is adjusted to its rearmost position.

A first preferred embodiment of a position adjustable pedal assembly will be described with reference to Figs. 1 to 4, wherein the pedal assembly is applied to a brake pedal.

In Figs. 1 and 2, a stationary bracket 2 is fixed to a dash panel of a vehicle body. A lever 4 generally of a triangle shape is pivotably connected at its upper end to the stationary bracket 2 with a pivot pin 6. As can be seen from Fig. 2, the lever 4 is generally of a hollow cubic shape having a right side wall 4a, a left side wall 4b, a front wall 4c and a back wall 4d. A return spring 8 is wound onto the pivot pin 6 for urging the lever 4 counterclockwise in Fig. 1 when a depression force is applied by a driver to push the lever 4 clockwise in Fig. 1. A pin 10 is fixedly provided on the right side wall 4a of the lever 4 for pivotably supporting an adjust lever 12. The lever 4 is formed with a pair of arc-shaped holes 14 at the right and left side walls 4a and 4b. A support pin 16 is inserted into the arc-shaped holes 14 for pivotably supporting the adjust lever 12 and one end of a link member 18 on the right side wall 4a. The other end of the link member 18 is pivotably connected to an auxiliary lever 20 through a pivot pin 22. The auxiliary lever 20 is in turn pivotably connected to the stationary bracket 2 through a pivot pin 24. A brake operating rod 26 is pivotably connected at its one end to the pin 22 to be operated in synchronism with displacement of the link member 18. The operating rod 26 is connected at its other end to a vehicle operation system such as a braking system (not shown).

A tension spring 28 is connected at its lower end to the support pin 16 and at its upper end to

the stationary bracket 2. In Fig. 1, the tension spring 28 is in a balanced position supporting a weight applied to the support pin 16. Accordingly, the return spring 8 is not energized when no depression force is applied to the lever 4. The adjust lever 12 is generally of a Z-shape and is formed with an arc-shaped hole 12b at its arc-shaped elongate section 12a. A radius of curvature of the arc-shaped hole 12b is not constant therealong, which will be described later.

The right side wall 4a of the lever 4 is formed with a pair of elongate holes 30 and 32 which extend in parallel to each other in the longitudinal direction of the vehicle. Forward ends as well as rearward ends of the elongate holes 30 and 32 are not vertically aligned, respectively, which will be described later. As can be seen from Fig. 2, the left side wall 4b of the lever 4 is also formed with a pair of holes which just correspond to the elongate holes 30 and 32 formed in the right side wall 4a. Slide pins 34 and 36 are slidably inserted into the elongate holes 30 and 32 of the right and left side walls 4a and 4b, respectively. A pedal arm 38 is inserted into the lever 4 between the right and side walls 4a and 4b and is supported by the slide pins 34 and 36 at differenct locations. The slide pin 34 further extends through the arc-shaped hole 12b of the adjust lever 12. The pedal arm 38 is provided with a pedal pad 39 at its lower end.

A screw nut 40 is fixed to the pedal arm 38 and a corresponding screw rod 42 is rotatably mounted to the front and back walls 4c and 4d. The screw nut 40 is of a cylindrical shape and formed with a threaded hole through which the screw rod 42 extends so as to be engaged with each other. An electric motor 44 is fixed to the front wall 4c and is connected to the screw rod 42 for actuating same. Specifically, the motor 44 is energized to rotate in the normal or reverse direction in response to the driver's switching operation. This rotation of the motor causes the screw rod 42 to rotate in the same direction with the motor 44. The screw nut 40 is guided by the rotation of the screw rod 42 to move along the screw rod 42. This movement of the screw nut 40 causes the pedal arm 38 along with the pedal pad 39 to move along the secrew rod 42, with the slide pins 34 and 36 each moving within the corresponding hole 30 or 32 between its forward and rearwad ends, as shown in Fig. 1 by the solid and dotted lines.

Now the operation of the first preferred embodiment will be described hereinbelow.

Fig. 3 shows the operation of the position adjustable pedal assembly, wherein the pedal pad 39 is adjusted to its foremost position. Specifically, the slide pins 34 and 36 are positioned at the forward ends of the elongate holes 30 and 32, respectively, and the slide pin 34 is also positioned at the forward end of the arc-shaped hole 12b. When the pedal pad 39 is depressed by the driver, as shown by the solid line in Fig. 3, the pedal arm 38 and the lever 4 pivot about the pivot pin 6 as one integral unit in the clockwise direction. This causes the link member 18 to move forwardly so as to rotate the auxiliary lever 20 about the pivot pin 24 in the clockwise direction. Accordingly , the pin 22 is displaced forwardly to push the operating rod 26 also forwardly so as to transmit the depressed force applied to the brake pedal pad 39 to the vehicle operation system (not shown) through the operating rod 26.

It is to be noted that since a line L1 is inclined at a predetermined angle to the vertical line VL, force F1 and F2 is applied to the slide pins 34 and 36 as shown in Fig. 1 in response to the depressing force applied to the brake pedal pad 39. Accordingly, the force which is to be applied to the slide pins 34 and 36 in a longitudinal direction of the elongate holes 30 and 32 is considerably reduced. On the other hand, if the slide pins 34 and 36 are vertically aligned, the force F1 and F2 is applied to the slide pins 34 and 36 in the direction along the length of the elongate holes 30 and 32. Accordingly the strength of the assembly becomes less and the operation of the pedal pad 39 becomes jerky since the slide pin 34 is not engaged with any member in the direction along the force F1.

When the brake pedal pad 39 is released from the depression force, the pedal arm 38 and the lever 4 return to the initial position as one integral unit by means of the energized force of the return spring 8 as shown by the dotted line in Fig. 3.

In order to adjust the pedal position away from the foremost position as shown in Fig. 3 to, for example, the rearmost position, the electric motor 44 is energized to rotate in the normal direction by operating the switch (not shown), which causes the screw rod 42 to rotate in the same direction. Accordingly, the screw nut 40 moves along the screw rod 42 rearwardly to slide the slide pins 34 and 36 within the corresponding elongate holes 30 and 32 also rearwardly, as shown by the solid line in Fig. 4 wherein the pedal position is adjusted to its rearmost position. Simultaneously, the slide pin 34 slides within the arc-shaped hole 12b from its forward end to its rearward end, which causes the adjust lever 12 to pivot about the pin 10 in the clockwise direction. This pivotal movement of the adjust lever 12 causes the support pin 16 to move downward within the arc-shaped hole 14. Simultaneously, the link member 18 pivots about the pin 22 in the clockwise direction, which, however, does not cause the auxiliary lever 20 to pivot about the pivot pin 24, i.e. the pin 22 does not move so that no force is applied to the operating rod 26 since a

radius of curvature of the arc-shaped hole 14 is the same as a distance between the center of the pin 22 and the center of the support pin 16.

As described before, the radius of curvature of the arc-shaped hole 12b is not constant therealong. Specifically, the radii of curvature of the arc-shaped hole 12b are selected such that when the support pin 16 moves downward or upward within the arc-shaped hole 14 in response to the sliding movement of the slide pin 34 within the arc-shaped hole 12b toward its rearward end or its forward end, respectively, a ratio of a distance DS to a distance DL is maintained constant, wherein the distance DS is a distance between the center of the pivot pin 6 and the center of the support pin 16 and the distance DL is a distance between the center of the pivot pin 6 and the center of the pedal pad 39. This ratio is maintained constant irrespective of the position of the slide pin 34 within the arc-shaped hole 12b. Accordingly, the force applied to the operating rod 26 and the required depression force or the leg power are kept constant irrespective of the adjusted pedal position under a condition that a distance of the pivotal displacement of the pedal pad 39 from the non-depressed position is the same.

Though the change in the distance DL causes a change in its center of gravity, which varies the required depression force or leg power, this variation is absdorbed by means of the tension spring 28 which stretches or compresses according to the position of the support pin 16.

As seen from Fig. 4, when the pedal pad 39 is depressed by the driver, the pedal arm 38 and the lever 4 pivot about the pivot pin 6 as one integral unit in the clockwise direction to move the link member 18 forward. Simultaneously, the pin 22 moves forward and the auxiliary lever 20 pivots about the pivot pin 24, so that the applied depression force is transmitted to the operating rod 26.

As seen from Fig. 4, a line L2 is inclined at the predetermined angle to the vertical line VL and force F3 and F4 is applied to the slide pins 34 and 36, respectively. This arrangement provides the same effect as described before with reference to Figs. 1 and 3.

When the pedal pad 39 is released from the depression force, the pedal arm 38 and the lever 4 return to the initial or the non-depressed position as shown by the solid line by means of the energized force of the return spring 8.

In order to return the pedal arm 38 to the position as shown by the solid line in Fig. 1, the electric motor 44 is energized to rotate in the reverse direction.

Now a second preferred embodiment of the position adjustable pedal assembly will be described with reference to Figs. 5 and 8, wherein the pedal assembly is applied to an accelerator pedal.

In Fig. 5 and 6, a stationary bracket 50 is fixed to a dash panel of the vehicle body. A lever 52 is pivotably connected to the stationary bracket 50 by a pivot pin 54. As can be seen from Fig. 6, the lever 52 is generally of a hollow cubic shape having a right side wall 52a, a left side wall 52b, a front wall 52c and a back wall 52d. A return spring 56 is wound onto the pivot pin 54 for urging the lever 52 counterclockwise in Fig. 5 when a depression force is applied by the driver to push the lever 52 in the clockwise direction.

An operating lever 58 is pivotably connected to the stationary bracket 50 by means of a pivot pin 60 at its lower end and is connected to an operating wire 61 at its upper end. The operating wire is in turn connected to a throttle valve of a vehicle operation system (not shown). The lever 52 is formed with a pair of elongate holes 62 and 64 just as in the first preferred embodiment. An adjust lever 66 is pivotably mounted to the lever 52 by means of a pin 68 which is fixed to the right side wall 52a of the lever 52. The adjust lever 66 is generally of a reversed-Z-shape and is formed with an arc-shaped hole 66b at its arc-shaped section 66a. A radius of curvature of the arc-shaped hole 66b is not constant, which will be described later. The adjust lever 66 has another arc-shaped section 66c which extends in the forward direction and is provided at its forward end with a slide pin 70 which engages with an arc-shaped hole 72. A radius of curvature of the arc-shaped hole 72 is the same as a distance between the center of the pin 68 and the center of the slide pin 70 so as to prevent the operating lever 58 from pivoting about the pivot pin 60 when the adjust lever 66 is pivoted about the pin 68 for adjusting the pedal position, which will be described later.

A pedal arm 74 is inserted into the lever 52 between the right and left side walls 52a and 52b and is provided with a bracket 76 at its upper portion. The pedal arm 74 is provided with an accelerator pedal pad 77. The bracket 76 is fixed to the pedal arm 74 and is provided with a pair of slide pins 78 and 80 at its upper and lower ends, respectively. Collars 82 and 84 are placed between the bracket 76 and the corresponding slide pins 78 and 80 as shown in Fig. 6. The slide pin 78 is inserted through the elongate holes 62 of the lever 52 and further through the arc-shaped hole 66b of the adjust lever 66. The slide pin 80 is inserted through the elongate holes 64 of the lever 52 and further through an elongate hole 86 formed in a stopper lever 88 which is pivotably connected to the lever 52 through a pivot pin 90. The elongate hole 86 is long enough to allow the slide pin 80 to move within the elongate hole 64 between its forward and rearward ends. The stopper lever 88 is formed with an engaging portion 92 at a side

opposite to the elongate hole 86 with respect to the pivot pin 90. The engaging portion 92 is engageable with an arc-shaped projection 94 of the stationary bracket 50, which projection 94 is formed at a lower rearward end of the stationary bracket 50. The engagement of the engaging portion 92 with the arc-shaped projection 94 prevents a clockwise pivotal movement of the lever 52 exceeding a predetermined value which is caused by the depression force applied by the driver. Curvature of the engaging portion 92 is not constant therealong. Specifically, the curvature of the engaging portion 92 is selected such that the engaging portion 92 engages with the arc-shaped projection 94 to stop the clockwise pivotal movement of the lever 52 exceeding the predetermined value in response to a constant distance of the pivotal displacement of the pedal pad 77 irrespective of the adjusted position of the pedal pad 77. The stationary bracket 50 is further formed with a stopper projection 96 at its upper rearward end. The stopper projection 96 is engageable with a corresponding forward end of the lever 52 so as to prevent a counterclockwise pivotal movement of the lever 52 exceeding a predetermined value.

A screw nut 98 is fixed to the bracket 76 and a corresponding screw rod 100 is rotatably mounted to the front and back walls 52c and 52d. The screw nut 98 is of a cylindrical stage and formed with a threaded hole through which the screw rod 100 extends so as to be engaged with each other. An electric motor 102 is fixed to the front wall 52c and is connected to the screw rod 100 for actuating same. Specifically, the motor 102 is energized to rotate in the normal or reverse direction in response to the driver's switching operation. This rotation of the motor causes the screw rod 100 to rotate in the same direction with the motor 102. The screw nut 98 is guided by the rotation of the screw rod 100 to move along the screw rod 100. This movement of the screw nut 98 causes the bracket 76, i.e. the pedal arm 74 along with the pedal pad 77 to move along the screw rod 100, with the slide pins 78 and 80 each moving within the corresponding hole 62 or 64 between its forward and rearwad ends, as shown in Fig. 5 by the solid and dotted lines.

A tension spring 104 is connected to the pivot pin 60 at its forward end and to the stopper lever 88 at its rearward end. The tension spring 104 is in a balanced position supporting a weight applied to the tension spring 104.

Now the operation of the second preferred embodiment will be described hereinbelow.

Fig. 7 shows the operation of the position adjustable pedal assembly, wherein the pedal pad 77 is adjusted to its foremost position. Specifically, the slide pins 78 and 80 are positioned at the forward ends of the elongate holes 62 and 64, respectively, and the slide pin 78 is also positioned at the forward end of the arc-shaped hole 66b. When the pedal pad 77 is depressed by the driver, as shown by the dotted line in Fig. 7, the pedal arm 74 and the lever 52 pivot about the pivot pin 54 as one integral unit in the clockwise direction. Simultaneously, the adjusted lever 66 pulls the operating lever 58 so that the operating lever 58 pivots about the pivot pin 60 in the clockwise direction to pull the operating wire 61 in the rearward direction, which in turn operates the throttle valve of the vehicle operation system (not shown).

When the clockwise pivotal movement of the lever 52 and the pedal arm 74 exceeds the predetermined value, the engaging portion 92 of the stopper lever 88 engages with the arc-shaped projection 94 of the stationary bracket 50 to prevent the further pivotal movement of the lever 52 and the pedal arm 74. On the other hand, when the depression force is released, the lever 52 and the pedal arm 74 pivot about the pivot pin 54 counterclockwise by means of the energized force of the return spring 56 to return to the initial position as shown by the solid line in Fig. 7.

In order to adjust the pedal position away from the foremost position as shown in Fig. 7 to, for example, the rearmost position, the electric motor 102 is energized to rotate in the normal direction by operating the switch (not shown), which causes the screw rod 100 to rotate in the same direction. Accordingly, the screw nut 98 moves along the screw rod 100 rearwardly to slide the slide pins 78 and 80 through the bracket 76 within the corresponding elongate holes 62 and 64 also rearwardly, as shown by the solid line in Fig. 8 wherein the pedal position is adjusted to its rearmost position. Simultaneously, the slide pin 78 slides within the arc-shaped hole 66b from its forward end to its rearward end, which causes the adjust lever 66 to pivot about the pin 68 in the counterclockwise direction. This pivotal movement of the adjust lever 66 causes the slide pin 70 to move downward within the arc-shaped hole 72. The sliding movement of the slide pin 70 within the arc-shaped hole 72 does not cause the operating lever 58 to pivot about the pivot pin 60 so that no force is applied to the operating wire 61 since a radius of curvature of the arc-shaped hole 72 is the same as a a distance between the center of the slide pin 70 and the center of the pivot pin 68.

As described before, the radius of curvature of the arc-shaped hole 66b is not constant therealong. Specifically, the radii of curvature of the arc-shaped hole 66b are selected such that when the slide pin 70 moves downward or upward within the arc-shaped hole 72 in response to the sliding movement of the slide pin 78 within the arc-shaped hole

66b toward its rearward end or its forward end, respectively, a distance between the center of the pivot pin 60 and the center of the slide pin 70 becomes in reverse proportion to a distance between the center of the pivot pin 54 and the center of the pedal pad 77. Accordingly, the force applied to the operating wire 61 and the required depression force or the leg power are kept constant irrespective of the adjusted pedal position under a condition that a distance of the pivotal displacement of the pedal pad 77 from the non-depressed position is the same.

As the slide pin 80 moves rearward within the elongate hole 64, the stopper lever 88 starts to pivot about the pivot pin 90 in the clockwise direction, which causes the engaging portion 92 also to pivot about the pivot pin 90. As described before, the curvature of the engaging portion 92 is not constant therealong. Specifically, the curvature of the engaging portion 92 is selected to allow the engaging portion 92 to contact with the arc-shaped projection 94 when the pedal pad 77 performs a pivotal displacement of a predetermined constant distance from the non-depressed position of the pedal pad 77, irrespective of an adjusted pedal position.

As seen from Fig. 8, when the pedal pd 77 is depressed by the driver, the pedal arm 74 and the lever 52 pivot about the pivot pin 54 as one integral unit in the clockwise direction to actuate the operating lever 58 through the adjust lever 66. Accordingly, the operating lever 58 pivots about the pivot pin 60 clockwise to pull the operating wire 61 rearwardly, so that the throttle valve of the vehicle operation system is in turn actuated. The pivotal movement of the lever 52 and the pedal arm 74 exceeding the predetermined value is prevented by means of the engagement between the engaging portion 92 and the arc-shaped projection 94. When the pedal pad 77 is released from the depression force, the pedal arm 74 and the lever 52 pivot about the pivot pin 54 counterclockwise to return to the initial or non-depressed position as shown by the solid line in Fig. 8 by means of the energized force of the return spring 56. A further counterclockwise movement is prevented by means of the engagement between the stopper projection 96 and the forward end of the lever 52.

In order to return the pedal arm 74 to the position as shown by the solid line in Fig. 5, the electric motor 102 is energized to rotate in the reverse direction.

As in the first preferred embodiment, the center of the slide pin 78 and the center of the slide pin 80 are not vertically aligned, which can provide the same effect as described in the first preferred embodiment.

Claims

1. A position-adjustable pedal assembly for a vehicle, comprising: a stationary bracket; a lever connected to said stationary bracket for a pivotal movement relative to said stationary bracket about a first pivot axis; a pedal arm with a pedal pad at its lower end, said pedal arm connected to said lever for a pivotal movement with said lever as one integral unit in response to a depression force applied to the pedal pad; a first linear track formed on said lever and extending in the longitudinal direction of the vehicle; a first guide member provided on said pedal arm and arranged to move within said first linear track so as to adjust a position of the pedal pad in the longitudinal direction of the vehicle, said movement of the first guide member changing a distance from said first pivot axis to said pedal pad; and operating member means provided between said lever and a vehicle operation system for receiving the depression force applied to said pedal pad and for transmitting said depression force to the vehicle operation system to operate same; characterised in that an adjust lever is provided on said lever, said adjust lever drivingly connected to a connecting member which is movable within a first arc-shaped track in response to a relative movement of said adjust lever to said lever, that said first guide member is movable within a second arc-shaped track formed on said adjust lever when said first guide member moves within said first linear track to adjust the position of the pedal pad in the longitudinal direction of the vehicle, that said movement of the first guide member within said second arc-shaped track allows said relative movement of the adjust lever to change a position of said connecting member within said first arc-shaped track so as to provide a predetermined relationship between said distance and a distance from said first pivot axis to said connecting member, and that said operating member means is connected to said connecting member for receiving therefrom the depression force applied to said pedal pad and for transmitting said depression force to the vehicle operation system to operate same.

2. A position adjustable pedal assembly as set forth in claim 1, characterised in that said first arc-shaped track is formed on said lever and oriented substantially in a vertical direction.

3. A position adjustable pedal assembly as set forth in claim 2, wherein the depression force is applied to the operating member means in a

forward direction of the vehicle to operate the vehicle operation system, characterised in that said connecting member moves within said first arc-shaped track in response to said relative movement of the adjust lever to provide said predetermined relationship in which a ratio between the distance from the first pivot axis to the pedal pad and the distance from the first pivot axis to the connecting member is maintained constant irrespective of an adjusted position of the pedal pad.

4. A position adjustable pedal assembly as set forth in claim 3, characterised in that radii of curvature of said second arc-shaped track formed on the adjust lever are preselected to maintain said distance ratio to be constant irrespective of the position of said first guide member within said second arc-shaped track.

5. A position adjustable pedal assembly as set forth in any one of claims 2 to 4, characterised in that spring means is connected to said stationary bracket at its upper end and to said connecting member at its lower end, said spring means stretching or compressing in response to the movement of said connecting member within said first arc-shaped track so as to change its spring force applied to said pedal pad via said connecting member, said lever and said pedal arm, said change of the spring force cancelling variation in a required depression force to be applied to said pedal pad, said variation in the required depression force being caused by variation in said distance from the first pivot axis to the pedal pad due to the adjustment of the pedal pad position in the longitudinal direction of the vehicle.

6. A position adjustable pedal assembly as set forth in any one of claims 2 to 5, wherein said operating member means includes an operating rod, characterised in that said operating member means includes a link member which is connected to said connecting member at its rearward end and connected to said operating rod at its forward end for a pivotal movement relative to said operating rod about a second pivot axis and that said first arc-shaped track has a radius of curvature which is the same as a distance from the connecting member to said second pivot axis for preventing displacement of the operating rod while the connecting member moves within said first arc-shaped track due to the adjustment of the pedal pad position in the longitudinal direction of the vehicle.

7. A position adjustable pedal assembly as set forth in any one of claims 1 to 6, wherein said first linear track is a first linear slot formed in said lever, said first guide member is a first slide pin fixed to said pedal arm at its portion opposite to said pedal pad, and said first slide pin is slidably engaged in said first linear slot, characterised in that said first arc-shaped track is a first arc-shaped slot formed in said lever, said connecting member is a second slide pin slidably engaged in said first arc-shaped slot, said second arc-shaped track is a second arc-shaped slot formed in said adjust lever, and said first slide pin is slidably engaged in said second arc-shaped slot.

8. A position adjustable pedal assembly as set forth in claim 7, characterised in that said adjust lever is generally of a Z-shape having a first portion extending generally in a forward direction of the vehicle, a second portion extending generally in a rearward direction of the vehicle and a third portion extending generally vertically to connect said first and second portions, said first portion being connected to said lever at its forward end for a pivotal movement relative to said lever and being connected to said second slide pin at its rearward end, and said second portion being formed therein with said second arc-shaped slot.

9. A position adjustable pedal assembly as set forth in claim 1, characterised in that said operating member means includes an operating lever connected at its one vertical end to said stationary bracket for a pivotal movement about a second pivot axis, said pivotal movement of the operating lever transmitting the depression force to said vehicle operation system, and that said first arc-shaped track is formed on said operating lever and oriented substantially in a vertical direction.

10. A position adjustable pedal assembly as set forth in claim 9, characterised in that said connecting member moves within said first arc-shaped track in response to said relative movement of the adjust lever to provide said predetermined relationship in which the distance from the first pivot axis to the connecting member decreases as the distance from the first pivot axis to the pedal pad increases due to the adjustment of the pedal pad position by the movement of the first guide member within said first linear track.

11. A position adjustable pedal assembly as set forth in claim 9 or claim 10, wherein said

operating member means includes an operating wire, characterised in that said operating lever is pivotably connected to the stationary bracket at its lower end and to said operating wire at its upper end, and that said connecting member applies the depression force to said operating lever in a rearward direction of the vehicle so as to operate the vehicle operation system when the depression force is applied to the pedal pad.

12. A position adjustable pedal assembly as set forth in any one of claims 9 to 11, characterised in that radii of curvature of said second arc-shaped track formed on the adjust lever are preselected to provide said predetermined distance relationship.

13. A position adjustable pedal assembly as set forth in any one of claims 9 to 12, wherein said first linear track is a first linear slot formed in said lever, and said first guide member is a first slide pin fixed to said pedal arm at its portion opposite to said pedal pad, said first slide pin slidably engaged in said first linear slot, characterised in that said first arc-shaped track is a first arc-shaped slot formed in said operating lever, said connecting member is a second slide pin slidably engaged into said first arc-shaped slot, said second arc-shaped track is a second arc-shaped slot formed in said adjust lever, and said first slide pin is slidably engaged in said second arc-shaped slot slidably.

14. A position adjustable pedal assembly as set forth in any one of claims 9 to 12, characterised in that said adjust lever is pivotably provided on said lever about a third pivot axis, and that said first arc-shaped track has a radius of curvature which is the same as a distance from the connecting member to said third pivot axis so as to prevent displacement of the operating lever while the connecting member moves within said first arc-shaped track because of said relative movement of the adjust lever when the first guide member moves within said second arc-shaped track.

15. A position adjustable pedal assembly as set forth in claim 13, characterised in that said adjust lever is generally of a reversed-Z-shape having a first portion extending generally in a forward direction of the vehicle, a second portion extending generally in a rearward direction of the vehicle and a third portion extending generally vertically to connect said first and second portions, said first portion being connected to said lever at its rearward end for a pivotal movement about a third pivot axis relative to said lever and being connected to said second slide pin at its forward end, said second portion being formed therein with said second arc-shaped slot, and that said first arc-shaped slot has a radius of curvature which is the same as a distance from said second slide pin to said third pivot axis so as to prevent displacement of the operating lever while the second slide pin moves within said first arc-shaped slot due to said relative pivotal movement of the reversed-Z-shaped adjust lever when the first slide pin moves within said second arc-shaped slot.

16. A position adjustable pedal assembly as set forth in claim 1 or in any one of claims 9 to 15, characterised in that stopper means is provided on said lever, said stopper means having an engaging portion of a shape which has a predetermined curvature, said engaging portion being pivotable about a fourth pivot axis relative to said lever according to the adjusted pedal pad position, said predetermined curvature of the engaging portion being non-constant therealong and preselected such that said engaging portion contacts said stationary bracket to prevent the pivotal movement of said lever about said first pivot axis exceeding a value corresponding to a predetermined constant pivotal displacement distance of said pedal pad from its non-depressed position irrespective of the adjusted pedal pad position.

17. A position adjustable pedal assembly as set forth in claim 16, wherein a second guide member in the form of a third slide pin is fixed to said pedal arm below said first guide member, and a second linear track in the form of a second linear slot is formed in said lever, said third slide pin being engaged in said second linear slot for sliding movement therewithin when said pedal pad position is adjusted in the longitudinal direction of the vehicle, characterised in that said stopper means includes an elongate lever which is pivotable about said fourth pivot axis, said elongate lever having said engaging portion and a third linear slot extending therealong for slidably receiving said third slide pin therein, and that said pivotal movement of the engaging portion is caused when the third slide pin slides along said second linear slot when the pedal pad position is adjusted in the longitudinal direction of the vehicle.

18. A position adjustable pedal assembly as set forth in claim 17, characterised in that spring means is provided between said stationary bracket and said elongate lever, said spring means stretching or compressing in response to the pivotal movement of said elongate lever so as to change its spring force applied to said pedal pad, said change of the spring force compensating for variation in a required depression force to be applied to said pedal pad, said variation in the required depression force being caused by variation in said distance from the first pivot axis to the pedal pad because of the adjustment of the pedal pad position in the longitudinal direction of the vehicle.

Patentansprüche

1. Einstellbare Pedaleinrichtung für ein Fahrzeug, mit einem stationären Arm, einem Hebel, der mit dem stationären Arm zur Schwenkbewegung relativ zu dem stationären Arm um eine erste Schwenkachse verbunden ist, einem Pedelarm mit einem Pedalfußstück an seinem unteren Ende, wobei der Pedalarm mit dem Hebel zur Schwenkbewegung mit dem Hebel als eine integrale Einheit infolge einer auf das Pedalfußstück ausgeübten Niederdrückkraft verbunden ist, einer ersten linearen Führungsspur an dem Hebel, die sich in der Längsrichtung des Fahrzeugs erstreckt, einem ersten Führungsteil an dem Pedalarm, das so angeordnet ist, daß es sich in der ersten linearen Führungsbahn bewegt, um eine Position des Pedalfußstück in Längsrichtung des Fahrzeugs einzustellen, wobei die Bewegung des ersten Führungsteil einen Abstand der ersten Schwenkachse zu dem Pedalfußstück ändert, und mit einer Betätigungsteileinrichtung zwischen dem Hebel und einem Fahrzeugbetriebssystem zur Aufnahme der Niederdrückkraft, die auf das Pedalfußstück ausgeübt ist, und zum Übertragen der Niederdrückkraft auf das Fahrzeugbetriebssystem zu dessen Betätigung,
dadurch gekennzeichnet,
daß ein Einstellhebel an dem Hebel vorgesehen ist, wobei der Einstellhebel antriebsmäßig mit einem Verbindungsteil verbunden ist, welches innerhalb einer ersten bogenförmigen Führungsbahn infolge einer relativen Bewegung des Einstellhebels gegenüber dem Hebel bewegbar ist, daß das erste Führungsteil innerhalb einer zweiten bogenförmigen Führungsbahn bewegbar ist, die an dem Einstellhebel ausgebildet ist, wenn das erste Führungsteil sich innerhalb der ersten linearen Führungsbahn bewegt, um die Position des Pedalfußstücks in der Längsrichtung des Fahrzeugs einzustellen, daß die Bewegung des ersten Führungsteil in der zweiten bogenförmigen Führungsbahn es erlaubt, daß die relative Bewegung des Einstellhebels eine Position des Verbindungsteils innerhalb der ersten bogenförmigen Führungsbahn ändert, so daß eine vorbestimmte Relation zwischen dem Abstand und einem Abstand von der ersten Schwenkachse zu dem Verbindungsteil vorgesehen ist, und daß die Betätigungsteileinrichtung mit dem Verbindungsteil verbunden ist, um davon die auf das Pedalfußstück ausgeübte Niederdrückkraft aufzunehmen und um die Niederdrückkraft auf das Fahrzeugbetriebssystem zu dessen Betätigung zu übertragen.

2. Einstellbare Pedaleinrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die erste bogenförmige Führungsbahn an dem Hebel ausgebildet und im wesentlichen in einer vertikalen Richtung angeordnet ist.

3. Einstellbare Pedaleinrichtung nach Anspruch 2, wobei die Niederdrückkraft auf die Betätigungsteileinrichtung in einer Vorwärtsrichtung des Fahrzeugs ausgeübt wird, um das Fahrzeugbetriebssystem zu betätigen,
dadurch gekennzeichnet, daß das Verbindungsteil sich in der ersten bogenförmigen Führungsbahn infolge der relativen Bewegung des Einstellhebels bewegt, um die vorbestimmte Relation vorzusehen, in der ein Verhältnis zwischen dem Abstand von der ersten Schwenkachse zu dem Pedalfußstück und dem Abstand von der ersten Schwenkachse zu dem Verbindungsteil ungeachtet einer eingestellten Positon des Pedalfußstücks konstant aufrecht erhalten wird.

4. Einstellbare Pedaleinrichtung nach Anspruch 3, dadurch gekennzeichnet, daß die Krümmungsradien der zweiten bogenförmigen Führungsbahn an dem Einstellhebel so ausgewählt sind, daß das Abstandsverhältnis ungeachtet der Position des ersten Führungsteil innerhalb der zweiten bogenförmigen Bahn konstant gehalten wird.

5. Einstellbare Pedaleinrichtung nach jedem der Ansprüche 2 bis 4, dadurch gekennzeichnet, daß eine Federeinrichtung mit dem stationären Arm an ihrem oberen Ende und mit dem Verbindungsteil an ihrem unteren Ende verbunden ist, daß die Federeinrichtung entsprechend der Bewegung des Verbindungsteils innerhalb der ersten bogenförmigen Führungsbahn gedehnt oder zusammengedrückt wird, um ihre Feder-

kraft zu ändern, die auf das Pedalfußstück über das Verbindungsteil, den Hebel und den Pedalarm ausgeübt wird, wobei die Änderung der Federkraft Variationen in einer erforderlichen Niederdrückkraft, die auf das Pedalfußstück aufzubringen ist, ausgleicht, und die Variation der erforderlichen Niederdrückkraft durch Veränderung des Abstandes von der ersten Schwenkachse zu dem Pedalfußstück infolge der Einstellung der Pedalfußstückposition in Längsrichtung des Fahrzeugs hervorgerufen ist.

6. Einstellbare Pedaleinrichtung nach jedem der Ansprüche 2 bis 5, wobei die Betätigungsteileinrichtung eine Betätigungsstange aufweist, dadurch gekennzeichnet, daß die Betätigungsteileinrichtung ein Gelenkteil aufweist, welches mit dem Verbindungsteil an seinem hinteren Ende und mit der Betätigungsstange an seinem vorderen Ende zur Schwenkbewegung gegenüber der Betätigungsstange um eine zweite Schwenkachse verbunden ist, und daß die erste bogenförmige Bahn einen Kurvenradius hat, der mit einem Abstand von dem Verbindungsteil zu der zweiten Schwenkachse übereinstimmt, um die Verlagerung der Betätigungsstange zu verhindern, während das Verbindungsteil sich in der ersten bogenförmigen Bahn infolge der Einstellung der Pedalfußstückposition in Längsrichtung des Fahrzeugs bewegt.

7. Einstellbare Pedaleinrichtung nach jedem der Ansprüche 1 bis 6, wobei die erste lineare Führungsbahn ein erster linearer Schlitz in dem Hebel ist, das erste Führungsteil ein erster Gleitstift ist, der an dem Pedalarm an einem Abschnitt gegenüber dem Pedalfußstück befestigt ist und wobei der erste Führungsstift verschieblich in den ersten linearen Schlitz eingreift, dadurch gekennzeichnet, daß die erste bogenförmige Bahn ein erster bogenförmiger Schlitz in dem Hebel ist, daß das Verbindungsteil an zweiter Gleitstift ist, der verschieblich in den ersten bogenförmigen Schlitz eingreift, daß die zweite bogenförmige Bahn ein zweiter bogenförmiger Schlitz in dem Einstellhebel ist und daß der erste Gleitstift verschieblich in den zweiten bogenförmigen Schlitz eingreift.

8. Einstellbare Pedaleinrichtung nach Anspruch 7, dadurch gekennzeichnet, daß der Einstellhebel allgemein eine Z-Form hat, mit einem ersten Abschnitt, der sich allgemein in Vorwärtsrichtung des Fahrzeugs erstreckt, einem zweiten Abschnitt, der sich allgemein in Rückwärtsrichtung des Fahrzeugs erstreckt, und einem dritten Abschnitt, der allgemein vertikal verläuft, um den ersten und den zweiten Abschnitt miteinander zu verbinden, daß der erste Abschnitt mit dem Hebel an seinem vorderen Ende zur Schwenkbewegung gegenüber dem Hebel verbunden und an seinem hinteren Ende mit dem zweiten Gleitstift verbunden ist, und daß der zweite Abschnitt mit dem zweiten bogenförmigen Schlitz versehen ist.

9. Einstellbare Pedaleinrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Betätigungsteileinrichtung einen Betätigungshebel aufweist, der an einem vertikalen Ende mit dem stationären Arm zur Schwenkbewegung um die zweite Schwenkachse verbunden ist, daß die Schwenkbewegung des Betätigungshebels die Niederdrückkraft auf das Fahrzeugbetriebssystem überträgt, und daß die erste bogenförmige Führungsbahn an dem Betätigungshebel ausgebildet und im wesentlichen in vertikaler Richtung ausgerichtet ist.

10. Einstellbare Pedaleinrichtung nach Anspruch 9, dadurch gekennzeichnet, daß das Verbindungsteil sich innerhalb der ersten bogenförmigen Führungsbahn infolge der relativen Bewegung des Einstellhebels bewegt, um die vorbestimmte Relation zu schaffen, in der der Abstand von der ersten Schwenkachse zu dem Verbindungsteil sich verringert, wenn der Abstand von der ersten Schwenkachse zu dem Pedalfußstück infolge der Einstellung der Pedalfußstückposition durch die Bewegung des ersten Führungsteils in der ersten linearen Führungsbahn anwächst.

11. Einstellbare Pedaleinrichtung nach Anspruch 9 oder 10, wobei die Betätigungsteileinrichtung einen Betätigungsdraht aufweist, dadurch gekennzeichnet, daß der Betätigungshebel schwenkbar mit dem stationären Arm an seinem unteren Ende und mit dem Betätigungsdraht an seinem oberen Ende verbunden ist, und daß das Verbindungsteil die Niederdrückkraft auf den Betätigungshebel in einer Rückwärtsrichtung des Fahrzeugs ausübt, um das Fahrzeugbetriebssystem zu betätigen, wenn die Niederdrückkraft auf das Pedalfußstück ausgeübt wird.

12. Einstellbare Pedaleinrichtung nach jedem der Ansprüche 9 bis 11, dadurch gekennzeichnet, daß die Krümmungsradien der zweiten bogenförmigen Führungsbahn an dem Einstellhebel so ausgewählt sind, daß das bestimmte Abstandsverhältnis geschaffen ist.

13. Einstellbare Pedaleinrichtung nach jedem der Ansprüche 9 bis 12, wobei die erste lineare Führungsbahn ein erster linearer Schlitz in dem Hebel und das Führungsteil ein erster Gleitstift ist, der an dem Pedalarm an einem Abschnitt gegenüber dem Pedalfußstück befestigt ist, wobei der erste Führungsstift verschieblich in den ersten linearen Schlitz eingreift,
dadurch gekennzeichnet, daß die erste bogenförmige Führungsbahn ein erster bogenförmiger Schlitz ist, der in dem Betätigungshebel ausgebildet ist, daß das Verbindungsteil ein zweiter Gleitstift ist, der verschieblich in den ersten bogenförmigen Schlitz eingreift, daß die zweite bogenförmige Führungsbahn ein zweiter bogenförmiger Schlitz ist, der in dem Einstellhebel ausgebildet ist, und daß der erste Führungsstift verschieblich in den zweiten bogenförmigen Schlitz eingreift.

14. Einstellbare Pedaleinrichtung nach jedem der Ansprüche 9 bis 12, dadurch gekennzeichnet, daß der Einstellhebel schwenkbar an dem Hebel um eine dritte Schwenkachse angeordnet ist und daß die erste bogenförmige Führungsbahn einen Kurvenradius hat, der mit einem Abstand von dem Verbindungsteil zu der dritten Schwenkachse übereinstimmt, um eine Verlagerung des Betätigungshebels zu verhindern, während sich das Verbindungsteil innerhalb der ersten bogenförmigen Führungsbahn bewegt, wegen der relativen Bewegung des Einstellhebels, wenn sich das erste Führungsteil innerhalb der zweiten bogenförmigen Bahn bewegt.

15. Einstellbare Pedaleinrichtung nach Anspruch 13,
dadurch gekennzeichnet, daß der Einstellhebel allgemein eine umgekehrte Z-Form hat mit einem ersten Abschnitt, der sich allgemein in Vorwärtsrichtung des Fahrzeugs erstreckt, einem zweiten Abstand, der sich allgemein in Rückwärtsrichtung des Fahrzeugs erstreckt, und einem dritten Abstand, der allgemein vertikal verläuft, um den ersten und den zweiten Abschnitt zu verbinden, daß der erste Abschnitt mit dem Hebel an seinem rückwärtigen Ende zur Schwenkbewegung um eine dritte Schwenkachse gegenüber dem Hebel und mit dem zweiten Gleitstift an seinem vorderen Ende verbunden ist, daß der zweite Abschnitt den zweiten bogenförmigen Schlitz enthält, und daß der erste bogenförmige Schlitz einen Krümmungsradius hat, der mit einem Abstand von dem zweiten Gleistift zu der dritten Schwenkachse übereinstimmt, um eine Verlagerung des Betätigungshebels zu verhindern, während der zweite Gleitstift sich innerhalb des ersten bogenförmigen Schlitzes infolge der relativen Schwenkbewegung des umgekehrt Z-förmigen Einstellhebels bewegt, wenn der erste Gleitstift sich in dem zweiten bogenförmigen Schlitz bewegt.

16. Einstellbare Pedaleinrichtung nach Anspruch 1 oder jedem der Ansprüche 9 bis 15,
dadurch gekennzeichnet, daß eine Stoppeinrichtung an dem Hebel vorgesehen ist, daß die Stoppeinrichtungen einen Eingriffsabschnitt einer Form hat, die eine vorbestimmte Krümmung besitzt, daß der Eingriffsabschnitt um eine vierte Schwenkachse gegenüber dem Hebel entsprechend der eingestellten Pedalfußstückposition schwenkbar ist, wobei die vorbestimmte Krümmung entlang des Eingriffsabschnitts nicht konstant und so ausgewählt ist, daß der Eingriffsabschnitt den stationären Arm berührt, um die Schwenkbewegung des Hebels um die erste Schwenkachse über einen Wert hinaus zu verhindern, der einem vorbestimmten, konstanten Schwenkverlagerungsabstand des Pedalfußstücks von der nichtniedergedrückten Position ungeachtet der eingestellten Pedalfußposition entspricht.

17. Einstellbare Pedalanordnung nach Anspruch 16, wobei ein zweites Führungsteil in der Form eines dritten Gleitstiftes an dem Pedalarm unterhalb des ersten Führungsteils befestigt und eine zweite lineare Führungsbahn in der Form eines zweiten linearen Schlitzes in dem Hebel ausgebildet ist, wobei der dritte Gleitstift in den zweiten linearen Schlitz zur Gleitbewegung darin eingreift, wenn die Pedalfußstückposition in Längsrichtung des Fahrzeugs eingestellt wird,
dadurch gekennzeichnet, daß die Stoppeinrichtung einen langgestreckten Hebel aufweist, der um die vierte Schwenkachse schwenkbar ist, daß der langgestreckte Hebel den Eingriffsabschnitt und einen dritten linearen Schlitz aufweist, der sich entlang des Hebels erstreckt, um den dritten Gleitstift in sich aufzunehmen, und daß die Schwenkbewegung des Eingriffsabschnitts hervorgerufen wird, wenn der dritte Gleitstift entlang des zweiten linearen Schlitzes gleitet, wenn die Pedalfußstückposition in Längsrichtung des Fahrzeugs eingestellt wird.

18. Einstellbare Pedaleinrichtung nach Anspruch 17,
dadurch gekennzeichnet, daß eine Federeinrichtung zwischen dem stationären Arm und dem langgestreckten Hebel angeordnet ist, wo-

bei sich die Federeinrichtung streckt oder zusammendrückt infolge der Schwenkbewegung des langgestreckten Hebels, um so ihre Federkraft zu ändern, die auf das Pedalfußstück aufgebracht wird, daß die Änderung der Federkraft eine Variation in einer erforderlichen Niederdrückkraft, die auf das Pedalfußstück aufzubringen ist, kompensiert, und daß die Variation der erforderlichen Niederdrückkraft durch Veränderung des Abstandes von der ersten Schwenkachse zu dem Pedalfußstück infolge der Einstellung der Pedalfußstückposition in Längsrichtung des Fahrzeugs hervorgerufen wird.

Revendications

1. Ensemble de pédales réglable en position pour un véhicule, comprenant : une équerre fixe ; un levier relié à ladite équerre fixe pour subir un mouvement de pivotement par rapport à ladite équerre fixe autour d'un premier axe de pivotement; un bras de pédale portant un patin de pédale à son extrémité inférieure, ledit bras de pédale étant relié audit levier pour former une unité d'une seule pièce et subir un mouvement de pivotement en même temps que ledit levier en réponse à une force d'appui appliquée sur le patin de pédale ; une première piste linéaire formée sur ledit levier et orientée dans la direction longitudinale du véhicule ; un premier élément de guidage monté sur ledit bras de pédale et agencé pour se déplacer dans ladite première piste linéaire afin d'ajuster une position du patin de pédale dans la direction longitudinale du véhicule, ledit mouvement du premier élément de guidage modifiant la distance entre ledit premier axe de pivotement et ledit patin de pédale ; et un moyen d'élément actionneur monté entre ledit levier et un système de commande du véhicule pour recevoir la force d'appui exercée sur ledit patin de pédale et transmettre ladite force d'appui au système de commande du véhicule pour actionner ce dernier ; caractérisé en ce qu'un levier de réglage est monté sur ledit levier, ledit levier de réglage étant relié en entraînement à un élément de liaison qui est mobile dans une première piste cintrée en réponse à un mouvement relatif dudit levier de réglage par rapport audit levier, en ce que ledit premier élément de guidage est mobile dans une seconde piste cintrée formée sur ledit levier de réglage quand ledit premier élément de guidage se déplace dans ladite première piste linéaire pour ajuster la position du patin de pédale dans la direction longitudinale du véhicule, en ce que ledit mouvement du premier élément de guidage dans ladite seconde piste cintrée permet audit mouvement relatif du levier de réglage de modifier une position dudit élément de liaison dans ladite première piste cintrée afin d'établir une relation prédéterminée entre ladite distance et une distance qui sépare ledit premier axe de pivotement dudit élément de liaison, et en ce que ledit moyen d'élément actionneur est relié audit élément de liaison pour en recevoir la force d'appui exercée sur ledit patin de pédale et pour transmettre ladite force d'appui au système de commande du véhicule afin d'actionner ce dernier.

2. Ensemble de pédales réglable en position selon, la revendication 1, caractérisé en ce que ladite première piste cintrée est formée sur ledit levier et orientée sensiblement dans une direction verticale.

3. Ensemble de pédales réglable en position selon la revendication 2, dans lequel la force d'appui est appliquée sur le moyen d'élément actionneur dans une direction avant du véhicule pour actionner le système de commande du véhicule, caractérisé en ce que ledit élément de liaison se déplace dans la première piste cintrée en réponse audit mouvement relatif du levier de réglage pour établir ladite relation prédéterminée dans laquelle un rapport entre la distance du premier axe de pivotement au patin de pédale et la distance entre le premier axe de pivotement et l'élément de liaison est maintenu constant quelle que soit la position de réglage du patin de pédale.

4. Ensemble de pédales réglable en position selon la revendication 3, caractérisé en ce que les rayons de courbure de ladite seconde piste cintrée formée sur le levier de réglage sont pré-sélectionnés pour maintenir constant le rapport desdites distances quelle que soit la position dudit premier élément de guidage dans ladite seconde piste cintrée.

5. Ensemble de pédales réglable en position selon l'une des revendications 2 à 4, caractérisé en ce qu'un moyen à ressort est relié à ladite équerre fixe à son extrémité supérieure et audit élément de liaison à son extrémité inférieure, ledit moyen de ressort s'étirant ou se comprimant en réponse au mouvement dudit élément de liaison dans ladite première piste cintrée de manière à modifier la force de ressort appliquée sur ledit patin de pédale par l'intermédiaire dudit élément de liaison, ledit levier et ledit bras de pédale, ladite modification de

force de ressort annulant les variations de la force d'appui nécessaire qu'il faut appliquer audit patin de pédale, ladite variation de la force d'appui nécessaire étant provoquée par une variation de ladite distance entre le premier axe de pivotement et le patin de pédale sous l'effet du réglage de la position du patin de pédale dans la direction longitudinale du véhicule.

6. Ensemble de pédales réglable en position selon l'une quelconque des revendications 2 à 5, dans lequel ledit moyen d'élément actionneur comprend une tige d'actionneur, caractérisé en ce que ledit moyen d'élément actionneur comprend un élément de liaison qui est relié audit élément de liaison à son extrémité arrière et relié à ladite tige d'actionneur à son extrémité avant pour créer un mouvement de pivotement par rapport à ladite tige d'actionneur autour d'un second axe de pivotement et en ce que ladite première piste cintrée a un rayon de courbure qui est égal à la distance entre l'élément de liaison et ledit second axe de pivotement pour éviter le déplacement de la tige d'actionneur tandis que l'élément de liaison se déplace dans ladite première piste cintrée sous l'effet de l'ajustement de la position du patin de pédale dans la direction longitudinale du véhicule.

7. Ensemble de pédales réglable en position selon l'une quelconque des revendications 1 à 6, dans lequel ladite première piste linéaire est une première fente linéaire formée dans ledit levier, ledit premier élément de guidage est un premier axe coulissant fixé audit bras de pédale dans sa portion opposée audit patin de pédale, et ledit premier axe de coulissement est engagé en coulissement dans ladite première fente linéaire, caractérisé en ce que ladite première piste cintrée est une première fente cintrée formée dans ledit levier, ledit élément de liaison est un second axe coulissant introduit en coulissement dans ladite première fente cintrée, ladite seconde lente cintrée est une seconde lente cintrée formée dans ledit levier de réglage, et ledit premier axe de coulissement est en prise de coulissement dans ladite seconde lente cintrée.

8. Ensemble de pédales réglable en position selon la revendication 7, caractérisé en ce que ledit levier de réglage a généralement la forme d'un Z avec une première partie qui s'étend en général dans la direction avant du véhicule, une seconde partie qui s'étend généralement dans la direction arrière du véhicule et une troisième partie qui s'étend en général verticalement pour relier lesdites première et deuxième parties, ladite première partie étant reliée audit levier à son extrémité avant pour un mouvement pivotant par rapport audit levier et étant relié audit second axe de pivotement à son extrémité arrière, et ladite seconde partie étant formée avec ladite seconde fente cintrée.

9. Ensemble de pédales réglable en position selon la revendication 1, caractérisé en ce que ledit moyen d'élément actionneur comprend un levier d'actionnement relié à sa première extrémité verticale à ladite équerre fixe pour un mouvement de pivotement autour d'un second axe de pivotement, ledit mouvement de pivotement du levier d'actionnement transmettant la force d'appui audit système de commande du véhicule, et en ce que ladite première piste cintrée est formée sur ledit levier d'actionnement et orientée sensiblement dans une direction verticale.

10. Ensemble de pédales réglable en position selon la revendication 9, caractérisé en ce que ledit élément de liaison se déplace dans ladite première piste cintrée en réponse audit mouvement relatif du levier de réglage pour établir ladite relation prédéterminée dans laquelle la distance entre le premier axe de pivotement et l'élément de liaison diminue quand la distance entre le premier axe de pivotement et le patin de pédale augmente du fait du réglage de la position du patin de pédale par le mouvement du premier élément de guidage dans ladite première fente linéaire.

11. Ensemble de pédales réglable en position selon la revendication 9 ou 10, dans lequel ledit moyen d'élément actionneur comprend un câble actionneur, caractérisé en ce que ledit levier d'actionnement est relié en pivotement à ladite équerre fixe à son extrémité inférieure et audit câble actionneur à son extrémité supérieure, et en ce que ledit élément de liaison applique la force d'appui audit levier d'actionnement dans une direction arrière du véhicule de façon à actionner le système de commande du véhicule quand la force d'appui est appliquée sur le patin de pédale.

12. Ensemble de pédales réglable en position selon l'une quelconque des revendications 9 à 11, caractérisé en ce que les rayons de courbure de ladite seconde piste cintrée formée sur le levier de réglage sont pré-sélectionnés pour établir ladite relation de distance prédéterminée.

13. Ensemble de pédales réglable en position selon l'une quelconque des revendications 9 à 12, dans lequel ladite première piste linéaire est une première fente linéaire formée dans ledit levier, et ledit premier élément de guidage est un premier axe coulissant fixé audit bras de pédale dans sa partie opposée audit patin de pédale, ledit premier axe coulissant étant en prise de coulissement à l'intérieur de ladite première fente linéaire, caractérisé en ce que ladite première piste cintrée est une première fente cintrée formée dans ledit levier d'actionnement, ledit élément de liaison est un second axe coulissant en prise de coulissement dans ladite première fente cintrée, ladite seconde fente cintrée est une seconde fente cintrée formée dans ledit levier de réglage, et ledit premier axe coulissant est en prise de coulissement dans ladite seconde fente cintrée.

14. Ensemble de pédales réglable en position selon l'une quelconque des revendications 9 à 12, caractérisé en ce que ledit levier de réglage est monté en pivotement sur ledit levier autour d'un troisième axe de pivotement, et en ce que ladite première piste cintrée a un rayon de courbure qui est égal à la distance entre l'élément de liaison et ledit troisième axe de pivotement de façon à empêcher le déplacement du levier d'actionnement tandis que l'élément de liaison se déplace à l'intérieur de ladite première piste cintrée du lait du mouvement relatif du levier de réglage quand le premier élément de guidage se déplace à l'intérieur de ladite seconde piste cintrée.

15. Ensemble de pédales réglable en position selon la revendication 13, caractérisé en ce que ledit levier de réglage a en général la forme d'un Z inversé avec une première partie orientée généralement dans une direction avant du véhicule, une seconde partie orientée généralement dans la direction arrière du véhicule et une troisième partie s'étendant en général verticalement pour relier lesdites première et seconde parties, ladite première partie étant reliée audit levier à son extrémité arrière pour un mouvement de pivotement autour d'un troisième axe de pivotement par rapport audit levier et étant relié audit second axe de coulissement à son extrémité avant, ladite seconde partie étant formée avec à l'intérieur ladite seconde fente cintrée, et en ce que ladite première fente cintrée a un rayon de courbure qui est égal à la distance entre ledit second axe de coulissement et ledit troisième axe de pivotement de manière à empêcher le déplacement du levier d'actionnement pendant que le second axe de coulissement se déplace à l'intérieur de ladite première fente cintrée sous l'effet dudit mouvement de pivotement relatif du levier de réglage en forme de Z inversé quand le premier axe de coulissement se déplace à l'intérieur de ladite seconde fente cintrée.

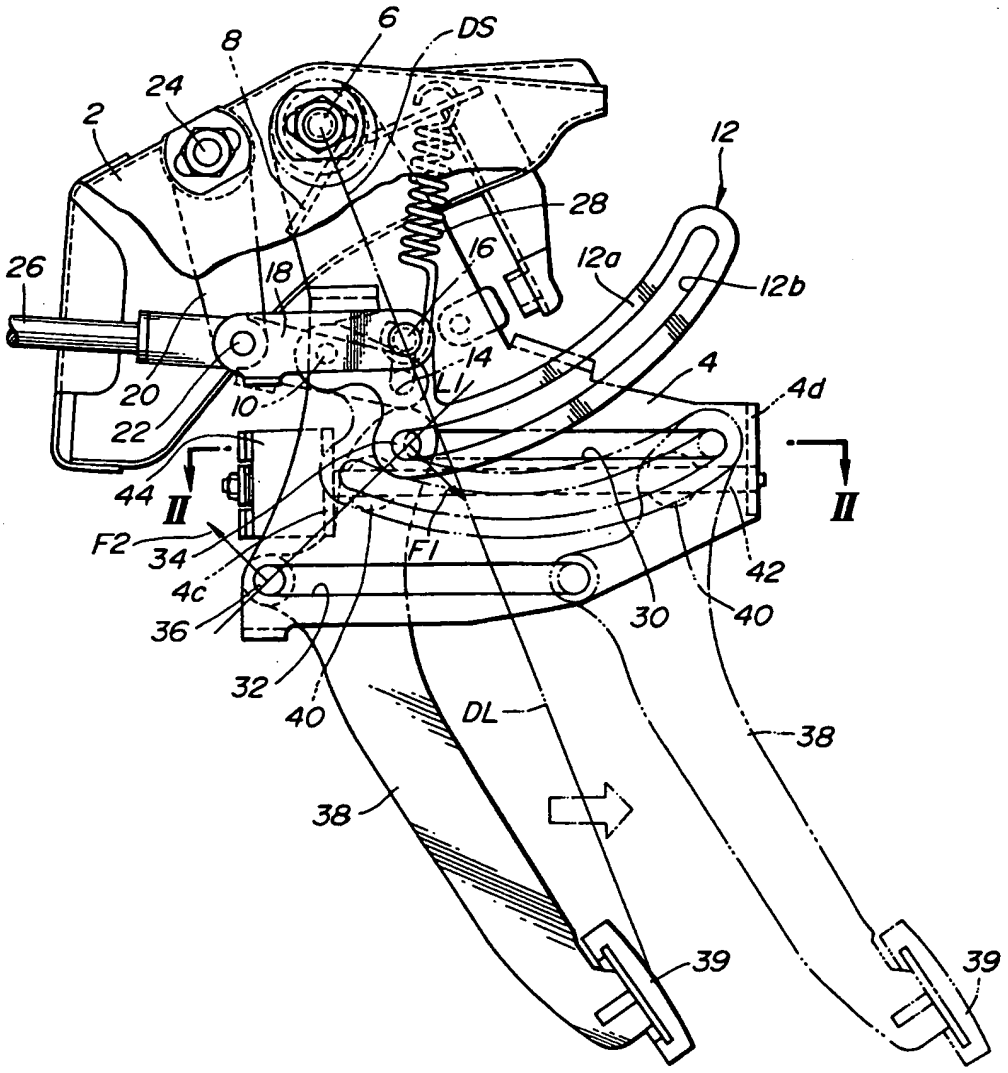
16. Ensemble de pédales réglable en position selon la revendication 1 ou l'une quelconque des revendications 9 à 15, caractérisé en ce qu'un moyen d'arrêtoir est prévu sur ledit levier, ledit moyen d'arrêtoir ayant une partie de prise d'une forme ayant une courbure prédéterminée, ladite partie de prise étant pivotante autour d'un quatrième axe de pivotement par rapport audit levier selon la position de réglage du patin de pédale, ladite courbure prédéterminée de la partie de prise n'étant pas constante le long de cette partie et étant pré-sélectionnée de manière que ladite partie de prise vienne en contact avec ladite équerre fixe pour empêcher que le mouvement de pivotement dudit levier autour dudit premier axe de pivotement ne dépasse une valeur correspondant à une distance de déplacement de pivotement constante prédéterminée dudit patin de pédale par rapport à sa position de repos quelle que soit la position de réglage du patin de pédale.

17. Ensemble de pédales réglable en position selon la revendication 16, dans lequel un second élément de guidage ayant la forme d'un troisième axe de coulissement est fixé audit bras de pédale au-dessous dudit premier élément de guidage, et une seconde piste linéaire ayant la forme d'une seconde fente linéaire est formée dans ledit levier, ledit troisième axe de coulissement étant engagé dans ladite seconde fente linéaire pour un mouvement de coulissement à l'intérieur de la fente quand ladite position du patin de pédale est réglée dans la direction longitudinale du véhicule, caractérisé en ce que ledit moyen d'arrêtoir comprend un levier allongé qui est pivotant autour dudit quatrième axe de pivotement, ledit levier allongé ayant ladite partie de prise et une troisième fente linéaire qui le traversent pour recevoir en coulissement à l'intérieur ledit troisième axe coulissant, et en ce que ledit mouvement de pivotement de la partie de prise est créé lorsque le troisième axe de coulissement glisse le long de ladite seconde fente linéaire alors que la position du patin de pédale est réglée dans la direction longitudinale du véhicule.

18. Ensemble de pédales réglable en position selon la revendication 17, caractérisé en ce qu'un

moyen de ressort est monté entre ladite équerre fixe et ledit levier allongé, ledit ressort s'étirant ou se comprimant en réponse au mouvement de pivotement dudit levier allongé de façon à modifier la force de ressort devant être appliquée sur ledit patin de pédale, ladite variation de la force de ressort compensant la variation de la force d'appui qu'il faut appliquer sur ledit patin de pédale, ladite variation de la force d'appui nécessaire étant provoquée par la variation de ladite distance entre le premier axe de pivotement et le patin de pédale du fait du réglage de la position du patin de pédale dans la direction longitudinale du véhicule.

FIG.1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39

FIG.2

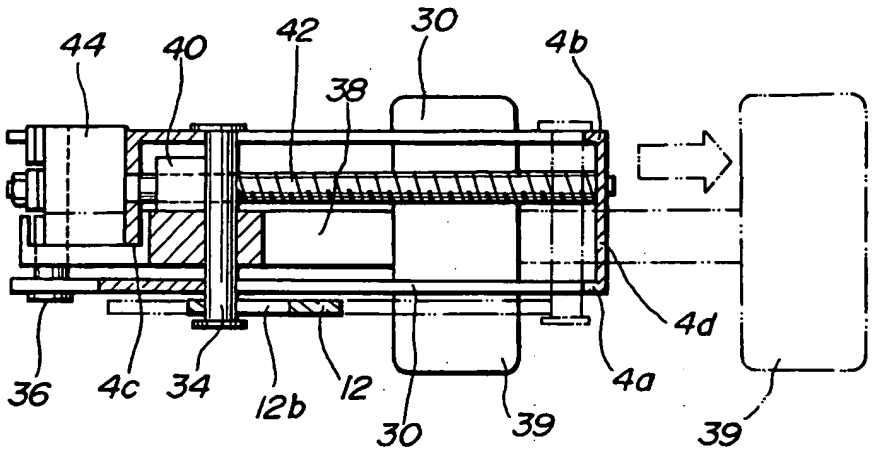
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FIG.6

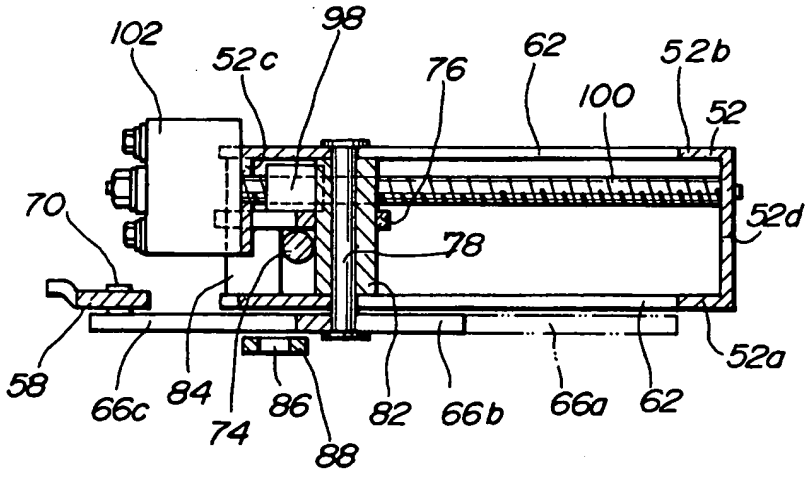
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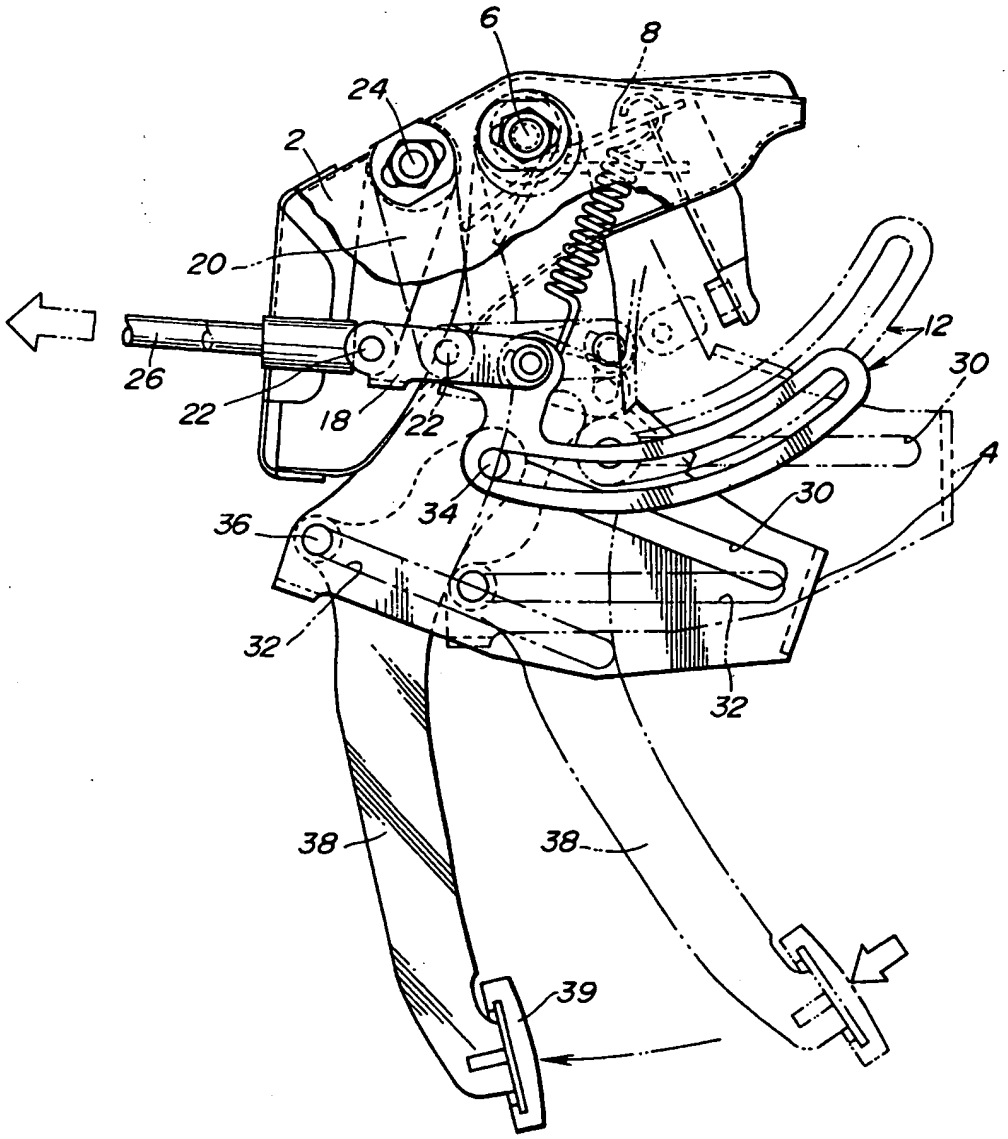
FIG. 3



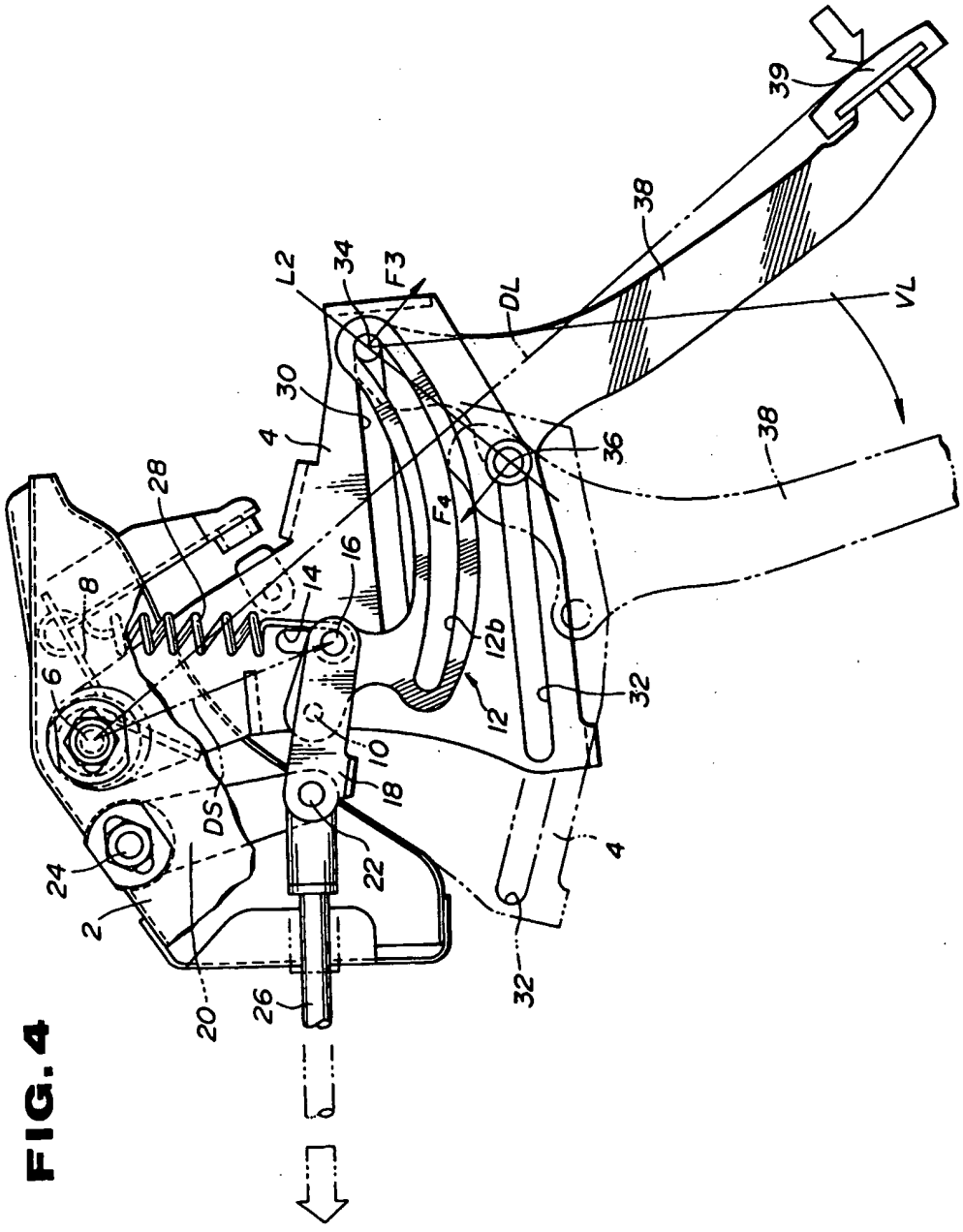

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FIG. 4

FIG. 5

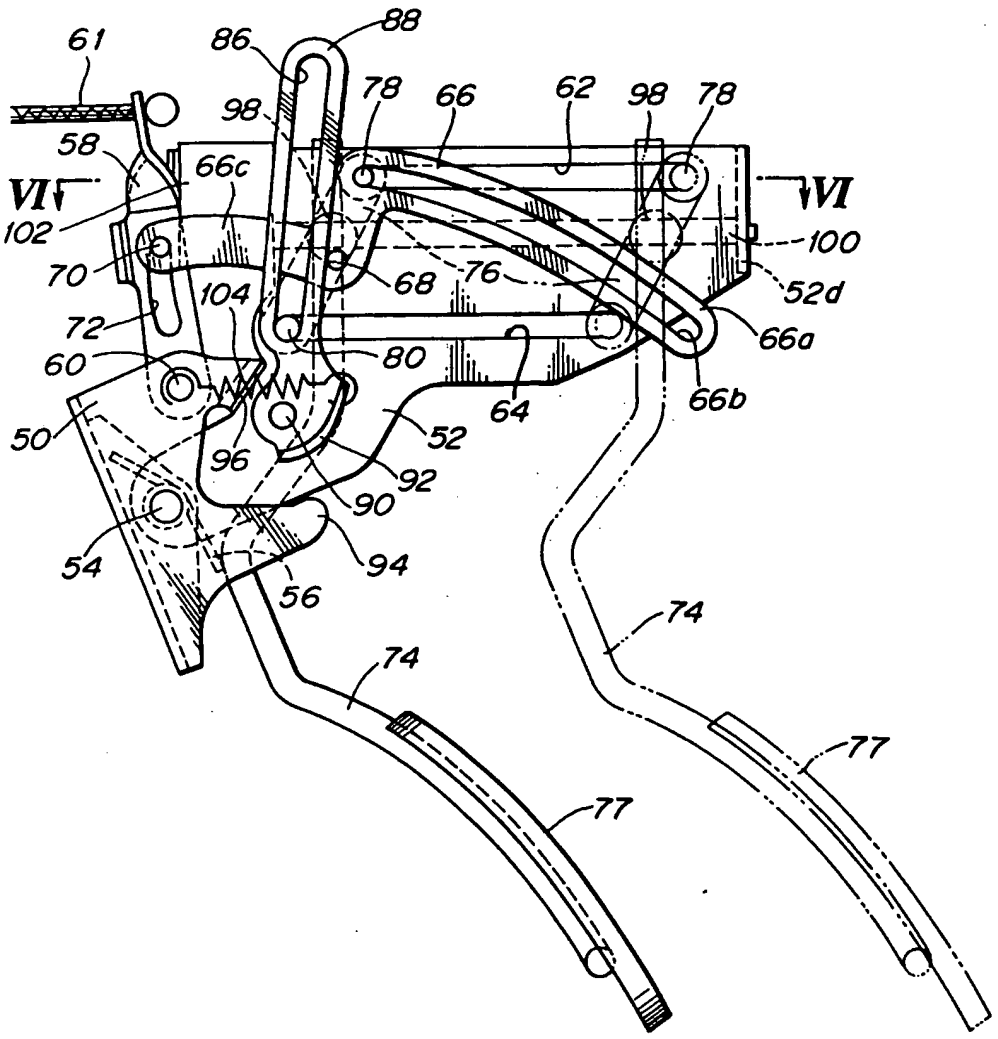
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FIG.7

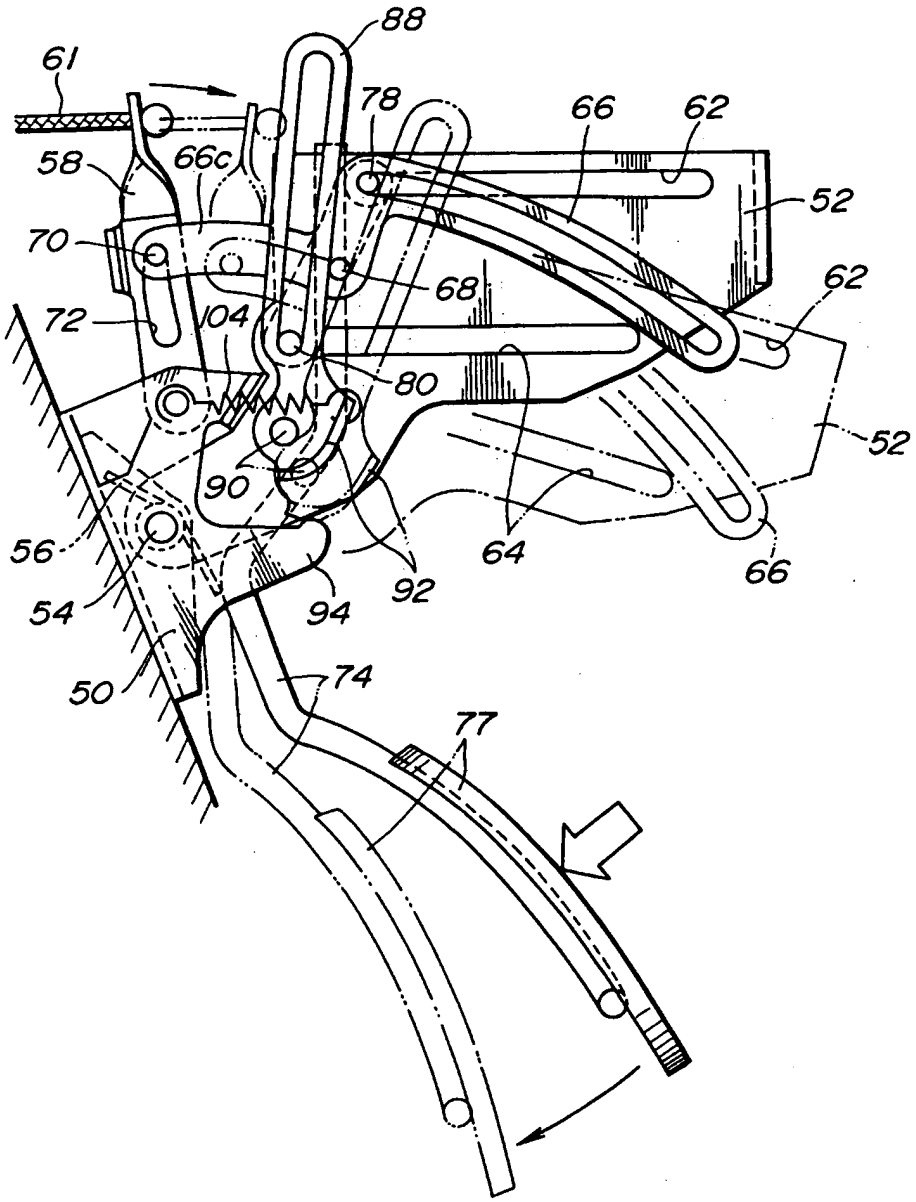
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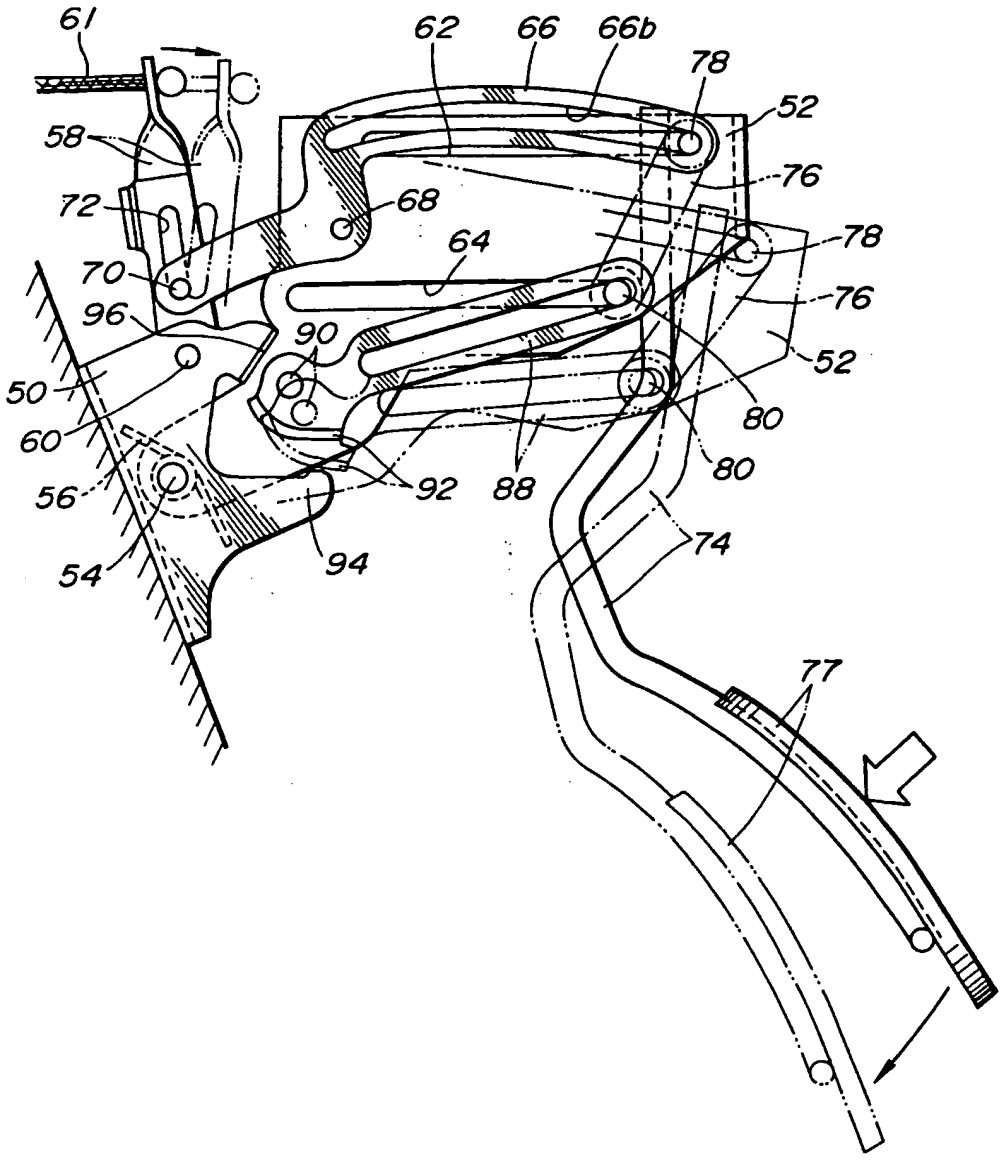
FIG.8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